

I Claim:

- 1 1. High-resolution sheet metal scanner using machine vision for checking the accuracy of
2 openings drilled or punched into a mechanical part, comprising:
3 a lower assembly which includes a housing which is environmentally sealed sufficiently
4 to exclude dust and contaminants; a planar scanning camera carriage assembly within said
5 housing and capable of producing controlled movement of a camera carriage member in two
6 orthogonal directions in a horizontal plane; a flat transparent support plate disposed on an upper
7 side of said housing on which said part is to be supported for viewing; and a camera assembly
8 mounted on said carriage member and oriented upwards including an imager for producing at
9 least one line of pixels and focussing means for focussing said imager upon an upper surface of
10 said support plate;
11 a generally linear illuminator mounted above said lower assembly and providing a
12 substantially uniform light along a line in one of said orthogonal directions, and being linearly
13 movable in the other of said orthogonal directions across said support plate;
14 camera carrier control means coupled with said camera carriage assembly and with said
15 camera assembly for guiding said camera assembly in a controlled scanning pattern within said
16 lower assembly housing and processing image data of said part based on pixels produced by said
17 camera assembly imager; and
18 illuminator control means for linearly moving said illuminator in the other of said
19 orthogonal directions to track motion of said camera carriage member.

1 2. The high-resolution sheet metal scanner of Claim 1 wherein said camera assembly includes a
2 polarizing filter.

1 3. The high-resolution sheet metal scanner of Claim 1 wherein said illuminator includes a single
2 fluorescent tube extending across said support plate.

- 1 4. The high-resolution sheet metal scanner of Claim 3 wherein said illuminator is disposed at
2 about one inch above said support plate.
- 1 5. The high-resolution sheet metal scanner of Claim 1 wherein said scanning camera carriage
2 assembly includes a first lead screw, a first stepper motor for controllably rotating said first lead
3 screw, a second lead screw, a second stepper motor for controllably rotating the second lead
4 screw, first and second stage rails arranged orthogonally and means for permitting said camera
5 carriage to travel along said first and second stage rails in accordance with rotation of said first
6 and second lead screws.
- 1 6. The high-resolution sheet metal scanner of Claim 5 including first and second high-resolution
2 encoders within said housing for determining X and Y location of said camera carriage.
- 1 7. The high-resolution sheet metal scanner of Claim 1 wherein said imager includes a linear
2 imager producing one line of pixels at a time.
- 1 8. The high-resolution sheet metal scanner of Claim 1 including position adjusting means for fine
2 adjustment of vertical position of said support plate.
- 1 9. The high-resolution sheet metal scanner of Claim 1 wherein said control means includes
2 means to adjust the dimensions of scan to the size of the part.
- 1 10. The high-resolution sheet metal scanner of Claim 1 wherein said lower assembly further
2 includes motion damping support means to minimize effects of floor vibration on action of the
3 scanning carriage assembly.
- 1 11. The high-resolution sheet metal scanner of Claim 10, wherein said motion damping means
2 includes means for tuning to damp out specific frequencies.

1 12. The high-resolution sheet metal scanner of Claim 1, wherein said camera has a body portion
2 with its center of gravity disposed beneath the plane of said scanning camera carriage assembly.

1 13. The high-resolution sheet metal scanner of Claim 1, wherein said linear illuminator is
2 mechanically independent of said camera carriage assembly.

1 14. The high-resolution sheet metal scanner of Claim 1, wherein said camera carrier control
2 means includes means for calibrating over the entire surface of said support plate to compensate
3 for defects in the linear rails and in the support plate.

1 15. The high-resolution sheet metal scanner of Claim 1, further comprising means for adjusting
2 the focussing means of said camera assembly to focus the camera at any of a plurality of
3 different heights above said support plate.